

Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

Claim 1 (currently amended): A high temperature fuel cell system comprising an anode channel, an anode inlet and an anode outlet, a first anode channel portion proximal to the anode inlet, a second anode channel portion proximal to the anode outlet, and a gas separation means operable to enrich a ~~first~~ hydrogen gas component of an anode exhaust gas exiting the anode outlet to produce a first product gas enriched in the said ~~first~~ hydrogen gas component such that at least a portion of the first product gas enriched in the hydrogen gas component can be provided as a portion of a fuel mixture supplied to the anode inlet, wherein;

the first anode channel portion comprises an anode material that is resistant to carbon deposition and active for direct oxidation of hydrogen, at least one hydrocarbon fuel or mixtures thereof; ~~and~~

the second anode channel portion comprises an anode material that is catalytically active for steam reforming of at least one hydrocarbon; and

the fuel mixture comprises steam, hydrogen and optionally at least one hydrocarbon fuel, wherein steam and hydrogen are present in proportions of no more than 1.5 moles of steam per mole of hydrogen or the molar ratio of steam to hydrocarbon fuel in the mixture is no greater than 1.5 to 1.

Claims 2-3 (canceled).

Claim 4 (currently amended): The high temperature fuel cell system according to claim 2 1 wherein the high temperature fuel cell comprises a solid oxide fuel cell.

Claims 5-6 (canceled).

Claim 7 (original): The high temperature fuel cell system according to claim 1 wherein the gas separation means comprises a rotary adsorption module containing an adsorbent material, and wherein the adsorbent material is capable of being periodically regenerated by means of pressure swing, temperature swing, displacement purge, or a combination thereof.

Claim 8-11 (canceled).

Claim 12 (new): The high temperature fuel cell system according to claim 1, further comprising:

a cathode channel having a cathode inlet and a cathode outlet, a second gas separation means operable to produce from air a first product gas enriched in oxygen, and a catalytic partial oxidation means wherein

said second gas separation means is fluidly connected to the cathode inlet such that the second gas separation means is capable of supplying at least a portion of the first oxygen-enriched product gas to the cathode inlet;

said catalytic partial oxidation means is fluidly connected to the cathode outlet such that the catalytic partial oxidation means is capable of receiving at least a portion of an exhaust gas from the cathode outlet for reaction with a hydrocarbon fuel mixture to produce a second product gas comprising syngas; and

the system is configured such that at least a portion of said second product gas can be provided as a portion of a fuel gas mixture which is supplied to the anode inlet.

Claim 13 (new): The high temperature fuel cell system according to claim 12, wherein the anode and cathode channels are arranged such that the fuel gas mixture in the anode channel is capable of flowing in a direction countercurrent to a flow of the oxygen-enriched gas in the cathode channel.

Claim 14 (new): The high temperature fuel cell system according to claim 1, wherein the first anode channel portion comprises an anode material selected from Cu/CeO₂/YSZ, Cu-GDC,

Cu/Bi₂O₃, (La,Sr)(Ti,Ce)O₃ or a mixture thereof, and the second anode channel portion comprises an anode material selected from Ni/YSZ, Ni/YDC, or NiGDC.

Claim 15 (new): The high temperature fuel system according to claim 1, wherein the gas separation means comprises a pressure swing adsorption module.

Claim 16 (new): A method of operating a fuel cell system, the fuel cell system comprising an anode channel, an anode inlet and an anode outlet, a first anode channel portion proximal to the anode inlet, a second anode channel portion proximal to the anode outlet, and a gas separation means, wherein the first anode channel portion comprises an anode material that is resistant to carbon deposition and active for direct oxidation of hydrogen, at least one hydrocarbon fuel or mixtures thereof, and the second anode channel portion comprises an anode material that is catalytically active for steam reforming of at least one hydrocarbon, the method comprising:

introducing an anode exhaust gas exiting the anode outlet into the gas separation means to produce a first product gas enriched in the a hydrogen gas component; and

introducing the first product gas enriched in the hydrogen gas component as a portion of a fuel mixture supplied to the anode inlet, wherein the fuel mixture comprises steam, hydrogen and optionally at least one hydrocarbon fuel, wherein steam and hydrogen are present in proportions of no more than 1.5 moles of steam per mole of hydrogen or the molar ratio of steam to hydrocarbon fuel in the mixture is no greater than 1.5 to 1.